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HOVERCRAFT SOCIETY

SOCIÉTÉ CANADIENNE
POUR LA TECHNOLOGIE DU COUSSIN D'AIR

1988 JOINT INTERNATIONAL CONFERENCE ON AIR CUSHION TECHNOLOGY

SEPTEMBER 1988

PROCEEDINGS

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Conférence internationale sur la technologie du coussin d'air

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Annapolis, Maryland

PROCEEDINGS

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Organisée par :

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The papers are published in the language in which they were presented at the conference. French translations of abstracts and summaries of papers are included immediately following their title pages.

Le contenu des documents ci-inclus n'engage que leurs auteurs et ne correspond pas nécessairement aux opinions ou aux vues du Centre de développement des transports, Transports Canada.

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16. Abstract

This report presents the papers given at the 1988 Joint International Conference on Air Cushion Technology held at the Radisson Annapolis Hotel, Annapolis, Maryland, U.S.A., September 27–29, 1988. The conference was organized jointly by the Canadian Air Cushion Technology Society and the United States Hovercraft Society. The co-chairmen of the conference were Jacques Laframboise of the Transportation Development Centre of Transport Canada and Allen Ford of the David Taylor Research Center, U.S. Navy.

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Ce rapport reproduit les mémoires présentés à la Conférence internationale sur la technologie du coussin d'air qui s'est tenue à l'hôtel Radisson Annapolis à Annapolis, Maryland (États-Unis), du 27 au 29 septembre 1988. Cette conférence était organisée conjointement par la Société canadienne pour la technologie du coussin d'air (CACTS) et la "United States Hovercraft Society". La coprésidence était assurée par Jacques Laframboise du Centre de développement des transports, Transports Canada, et par Allen Ford du David Taylor Research Center, U.S Navy.

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INTRODUCTION

The 1988 Joint International Conference on Air Cushion Technology was held at the Radisson Annapolis Hotel, Annapolis, Maryland, on September 27–29, 1988. The conference was organized by the United States Hovercraft Society and the Canadian Air Cushion Technology Society (CACTS). CACTS is affiliated with the Canadian Aeronautics and Space Institute.

Aimed at an international audience participating in, or having an interest in, the development of air cushion technology, the papers presented described the latest developments in this field in the United States of America, Canada, China and Sweden. The seventy-five attendees were welcomed by Jacques Laframboise, Chairman of the Canadian Air Cushion Technology Society, and by Allen Ford, President of the United States Hovercraft Society.

A technical visit was arranged by the organizers to Sandy Point State Park in Annapolis. This visit gave the conference participants an opportunity to inspect and observe demonstrations of a number of hovercraft including: two LCACs of the U.S. Navy, the LACV-30 of the U.S. Army and the Slingsbay 2200 of the Maryland Natural Resources Police.

The conference concluded with the presentation of the "Peter Heron Winter" award. This award is given each year to the author of the paper judged to be the best presented at the conference. The paper is judged on subject matter and written and oral presentation. This year the jury selected two papers and the award was shared by D.R. Lavis/B.G. Forstell and Ola Gullberg.

INTRODUCTION

La Conférence internationale sur la technologie du coussin d'air s'est déroulée à l'hôtel Radisson Annapolis, Annapolis, Maryland (États-Unis), du 27 au 29 septembre 1988. Cette conférence était organisée conjointement par la "United States Hovercraft Society" (USHS) et la Société canadienne pour la technologie du coussin d'air (CACTS), société affiliée à l'Institut aéronautique et spatial du Canada (CASI).

Les communications présentées s'adressaient à un auditoire international de spécialistes du domaine de la technologie du coussin d'air et couvraient les développements récents dans ce domaine aux États-Unis, au Canada, en Chine et en Suède. Les soixante-quinze participants furent accueillis par monsieur Jacques Laframboise, président du CACTS, et par monsieur Allen Ford, président de la USHS.

Une visite technique a été organisée par la USHS au "Sandy Point State Park", à Annapolis. Les participants ont eu l'opportunité d'examiner et de voir fonctionner quatre aéroglisseurs : deux LCAC de la marine américaine, le LACV-30 de l'armée américaine, ainsi que le Slingsbay 2200 de la police des ressources naturelles du Maryland.

La conférence s'est terminée avec la remise du trophée "Peter Heron Winter". Ce trophée est décerné annuellement à un auteur pour l'excellence du sujet traité et sa présentation. Cette année, le jury a couronné deux présentations, celle de messieurs D.R. Lavis et B.G. Forstell et celle de monsieur Ola Gullberg.

CONFERENCE HIGHLIGHTS/SOUVENIRS



Guest speaker, Captain C. Graham, Commander, David Taylor Research Center / Conférencier invité, Capitaine C. Graham, Commandant, David Taylor Research Center



Guest speaker, J.J. Kelly, President, Textron Marine Systems Conférencier invité, J.J. Kelly, Président, Textron Marine Systems



Guest speaker / Conférencier invité, Col M. B. Darling, U.S.M.C.



"Peter Heron Winter" award presented to Ola Gullberg and B.G. Forstell by Jacques Laframboise / Présentation du trophée "Peter Heron Winter" à messieurs Ola Gullberg et B.G. Forstell, par Jacques Laframboise



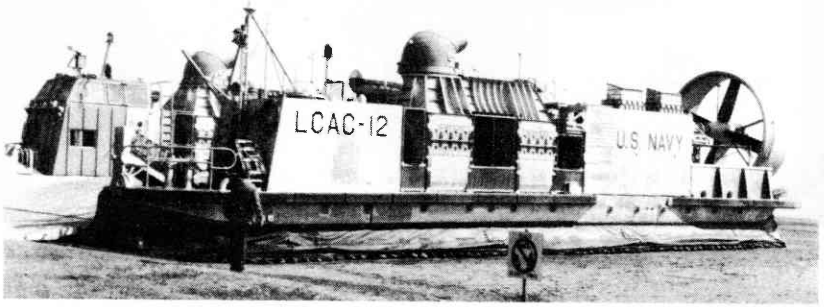
Interior of the Slingsbay 2200 operated by the Maryland Natural Resources Police
Poste de contrôle du Slingsbay 2200 de la Police des ressources naturelles du Maryland



Squadron Commander Duffy and crews of the LCAC's
Le Commandant Duffy et l'équipe des LCAC



Crew of the LACV-30
L'équipage du LACV-30



LCAC-12



D. Moran, Chairman / Président, Session 1



Allen Ford, President / Président, U.S. Hovercraft Society



J.D. Offutt, Chairman / Président, Session 3



C.R. Payne, Chairman / Président, Session 2

Dinner Speaker/Conférencier invité

From air cushion to surface effect vessels: A Marine Corps view

Col. M.B. Darling

Headquarter USMC, Washington, DC, U.S.A.

FROM AIR CUSHION TO SURFACE EFFECT VESSELS:

A MARINE CORPS VIEW

Marines have gained considerable experience recently in ship-to-shore movement of landing forces by hovercraft. The Landing Craft, Air Cushion (LCAC) has improved the speed, seakeeping and hydrographic independence of ship-to-shore surface movement dramatically.

The speed of the LCAC allows us to operate these platforms at sea, transferring equipment enroute to our objective. We can conduct advance force operations and raids much farther from our objective, without necessarily dedicating a separate advance force from an amphibious task force. Moreover, we can assault an enemy force from much greater distances, from over-the-horizon, and build up our landing force more rapidly in subsequent shuttles of these craft. Finally, LCAC speed gives us great improvements over former landing craft by reducing its vulnerability to enemy fires of all kinds.

The seakeeping performance of the air cushion craft has served us equally well in the open seaway, in the assault and through the surf. It gives us a reliable capability in face of the vagaries of weather, tide and sea state.

But for amphibious operations, the greatest payoff of the LCAC is in its hydrographic independence. We can now overcome natural and man-made obstacles, work throughout the tidal range and cross deepwater minefields, all conditions that we previously could not ignore.

Based upon our admittedly brief experience with hovercraft, we wonder if similarly improved capabilities can be obtained with large ships, applying surface effect technology to our larger amphibious assault ships. We have an excellent opportunity to influence ship designs in this direction through the coming decade. Not only must we build new amphibious ships, but also combat logistic ships to support our battle groups and fast sealift ships to support our theater commanders.

The question remains, however, can surface effect ship (SES) technology be used in a common design to satisfy these requirements? SES technology has been commended to the naval services by Congress for several years, and recently by the CNO's own Naval Studies Board, which deliberated over "Implementation of Engineering Technology for the Navy-Marine Corps of the 21st Century".

Multi-mission ship designs seem to offer a worthwhile course of action. Budget constraints mean we may not be able to afford large enough fleets of mission-peculiar ships to meet all commitments. In the case of the amphibious-logistic support-fast sealift category, there seems to be enough similarity in mission characteristics to justify an inquiry. In addition, these three missions could benefit materially from the speed and seakeeping improvements that we forsee with SES technology. It may be enough to observe that each of these missions involves high-value cargo and all presently require escort forces which will remain very scarce in the force structure of the 1990's.

Our opportunity for action in the next decade is shaped by the real requirement to replace 48 amphibious ships and 7 combat stores ships which will reach the end of their already over-extended service life. In addition, we must build an unspecified number of fast sealift ships to match our national strategy and the resulting force deployment requirements of our unified commanders. The capabilities of these ships are readily apparent. Any two of the three missions include common requirements for payload and transfer capabilities. Emphasizing modern concepts of modularization in naval architecture and containerization in payload handling ought to bring us close to a single idealized design, configured to carry a variable quantity of troops, containerized cargo, vehicles, craft, aircraft, and modules of C3I and self-defense systems as the missions require.

Conceptually, such a multi-mission ship might resemble a low-freeboard VTOL carrier with a single hangar deck, connected by ramps and elevators. Each deck could carry modules, containers, vehicles or aircraft, with the hanger deck accessible to the exterior near the waterline for Ro-Ro operations or air cushion vehicle embarkation. Some degree of compartmentation will be provided to allow the volume of the ship to minimize fractional damage, even in the absence of a major damage control investment.

We now want to look at speed as a common design requirement of this multi-mission hull. The kind of performance that we estimate we can obtain from SES technology will pay great dividends for amphibious, combat logistics, and fast sealift missions. The Navy has limited escort forces to support these missions. Given the already high requirements for protecting battle forces and merchant convoys, we forsee considerable difficulty in providing the numbers of escorts required for the protection of amphibious groups, replenishment groups, and intra-theater sealift. The high speed available in SES technology might make these forces self-escorting, a possibility saving enormous cost. The difficulty of detecting and targeting SES from submarines will remain almost insuperable. Countermeasures against mines, torpedoes and missiles become more effective when the ships' evasive manueuvers are a quantum improvement over current ship parameters. Even satellite targeting becomes complicated with the ocean space available to an SES between sensor passes. In fact, we conceive of a "free ride" for an SES multi-mission ship between continental shelf waters, unescorted, carrying only point defense weapons and perhaps VTOL aircraft for self-defense.

Besides enhancing the survivability of the platform, SES technology serves to improve the performance of the force. Specifically, SES multi-mission ships:

- reduce dependence on overseas bases
- reduce delays due to heavy weather
- preserve embarked troop effectiveness
- enhance strategic and tactical surprise
- expand options for time and location of action
- expand redeployment and resupply capabilities
- facilitate full payload VTOL aircraft operations
- increase available loading/embarkation time vs. transit time
- increase amphibious force training time ashore.

As a few examples, consider the following. An amphibious task force (SES) located some 400nm off Wilmington, N.C. could assault any part of the coastline from New York to Cape Canaveral in only seven hours. An SES replenishment group operating from Diego Garcia could reach a battle force at the mouth of the Persian Gulf in 24 hours. In a fast sealift reinforcement of Europe, a few SES could equal the performance of the entire C-5 airlift fleet. For intra-theater reinforcement, SES sealift could move forces from Plymouth, England to Narvik, Norway in 20 hours.

We stand today on a new threshhold of ship design and capabilities. SES technology offers us high speed operations in poor weather and sea conditions with greatly reduced vulnerability and high productivity for each hull. We can attack the unresolved technical issues now and build a 20,000 ton multi-mission SES with point defense systems that will improve our mission capabilities dramatically and at the same time respond to the ship requirements of the next decade.

If we steer this course, we will realize improvements in amphibious, logistic, and sealift capabilities similar to those we have already achieved in ship-to-shore operations with the hovercraft.

From the Marine Corps point of view, the way seems clear. Let us begin.